

*J. Willoughby. O. 6:10*

AN EXCELLENT  
INTRODUCTION  
TO  
Architecture.

Being A BOOK of  
GEOMETRICAL-PRACTICE:

Which is the  
First Degree of all ARTS: Wherein is  
Contained Variety of Examples of that Admirable  
Science, Shewing and describing the making of several  
Figures in that Nature, with the proper Names be-  
longing to each Member and Figure, and how to begin  
and end them after a plain and easie Manner, it being of  
great use to all Artists and Workmen concerned in  
Building;

MORE ESPECIALLY,

*Surveyors, Architects, Engineers, Masons, Carpenters,  
Joiners, Bricklayers, Plasterers, Painters, Carvers,  
Glaziers, &c.* In General, for all that are  
Concerned, or delight o pr Rise  
with the Rule and Compasses.

L O N D O N,

Printed for Robert Prick in *White-cross-street*, over against  
the *Cross Keys*: And the *Golden Lion* at the corner of  
*New-Cheapside* next *Bethlem*: Where likewise you  
may have Choice of other Books of *Architect*:

*As also Maps, Copy-Books, Italian, French  
and Dutch Prints.* MDCLXX.

RT *l*

1400 C. 24

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To the **READER.**

**G**eometry is a Greek word, which in its proper signification telleth us of no other thing then measuring of the Earth: Nevertheless, by this word we are to understand the principal Part of the Mathematicks, which is a Science that hath for its Object Quantity continued.

A continued quantity is that wherof all the parts are joined together, as are all sorts of Extensions, Greatness, and Dimensions.

And these Dimensions consist principally either in Lines, Angles, Superficies, or Bodies, which are to be considered, not according to the Quality of the Matter, but according to the Extension of the parts.

Geometry is divided into the Theorick, and the Practick. The Theorick is the Science which causeth us to conceive and demonstrate the truth of Geometrical Propositions. And the Practick is the Art which guideth the hand in its Operation.

Geometry had its beginning amongst the Egyptians, which were compelled to invent it, for to remedy the disorder that hapned ordinarily within their Grounds, by the overflowing of the River Nilus, which carried away all the Bounds, and defaced all the Limit-marks

of their Inheritances : and so this Exercise, which for the time consisted only in measuring the lands, for to render to every one that which belonged to him, was called the measuring of the earth or *Geometry*: but in process of time the *Egyptians* applied themselves to more subtle enquiries, and by degrees from an Exercise altogether Mechanical, they brought forth this excellent Science, which hath deserved to hold one of the chiefest ranks amongst all others.

*Geometry* is not only profitable, but we may say it is altogether necessary. It is by this the *Astrologians* make their observations; they know the extent of the Heavens, duration of times, Moving of the Stars, observations of the seasons of the Years and Ages.

It is by this the Geographers do cause us to see at one cast of an Eye the Greatness of the whole earth, the huge extension of the seas, the divisions of Empires, Kingdoms and Provinces.

It is from this the Architects do take their just measures in framing of publick Buildings, as well as of particular houses.

It is by the help of this Engineers do bring to pass all their intended projects, whereby they take the situation and plat-form of fortifications,

tifications, distance of places, and that they can at length carry their measure through Spaces accessible only to the sight.

Persons of quality, whose Birth engageth them to the wars, are obliged to apply themselves to this Science. It introduceth them not only to fortification, which teacheth them to build bulwarks, defend strong places, but also to compose and set up Engines which may overthrow them: and further also it brings them to very much knowledge and skill in the Military Art, how to order an Army for battel, how to encamp and divide Ground for quartering; likewise, it teacheth them to make Maps of countreys, to take the platform of towns, forts and castles, to measure all kind of dimensions both accessible and inaccessible, to invent projects; lastly, it maketh them to expert and commendable for their Wit and Inventions, as they can be for any strength or couragiousness in them.

All those that make profession of entering upon Designs, ought to know something of *Geometry*, seeing that they cannot otherwise attain the Art of Architecture, nor Perspective, which are two parts absolutely depending on that skill.

*Geometry* is established upon three sorts of Principles, *viz.* Definitions, Axioms, and Petitions.

1. The Definitions are brief Explications of the Names and Terms.
2. The Axioms are Sentences so true, and so manifest, that it is impossible to contradict them.
3. And the Petitions are clear and intelligible Demands, whereof the Execution and Practice requireth not any Demonstrations.

## Of Geometrical-Practice.

### *A Point.*



irst, you must understand that a Point is a Prick made with a Pen or Compass, which cannot be divided into parts, because it containeth neither length nor breadth in it.

### *A Line.*

A Line is a right consecutive imagination in length, beginning at a Point, and hath no breadth.

### *A Parallel.*

When two Lines are set or placed a little distance one from the other, those two Lines, according to the Latin phrase, are called Parallel, and by some equidistances.

### *Superficies.*

When these two Lines aforesaid are enclosed at each end with other Lines, it is then called a *Superficies*, and in like sort all spaces, in what manner soever they are closed, are called *Superficies* or Plains.

### *Perpendicu'ar*

When there is a streight upright line placed in the middle of a cross streight line, then it is called a Perpendicular or *Catbata* line, and the end of the Crosses or streight line on both sides of the Perpendicular are called streight Corners.

### *Acutus.Obtusus.*

When a leaning or streight line is placed upon a streight line, without Compass or Equality, as much as the same line bendeth, so much shall the corner of the streight line be narrower below, and the other so much broader, as a right and even corner, the streight corner in Latin is called *Acutus*, which signifieth sharp, and the wider *Obtusus*, which signifieth dull.

*Pyra*

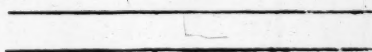
A Poynt.



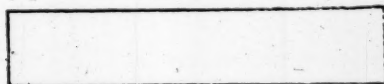
A Line.



Paralell.



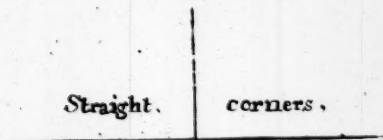
Superficies.



Perpendicular.

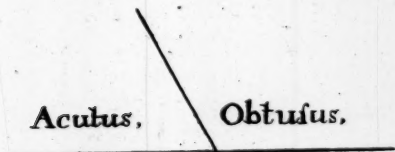
Straight.

corners.



Acutus.

Obtusius.



## Of Geometrical Practise.

### *Pyramidal.*

**A** Corner or Point called *Pyramidal*, and also *Acutus* in Latin is when two even long streight lines meet or joyn together at the upper end, as the Figure declareth.

### *Triangle.*

When such a Figure, as aforesaid, is closed together at the foot with a long streight line; it is then called a *Triangle*, because it hath three sharp corners.

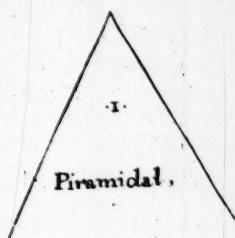
### *2. Triangle.*

**W**hen a *Triangle* with two even streight lines, is closed together with a longer line then these two are, it shall have such forme as you may see in the Figure of the third *Triangle*.

### *3. Triangle.*

**A** *Triangle* which is made of three unlike lines, will also have three unlike corners.

when



## Of Geometrical practice.

### *Quadrangle.*

**W**Hen two long and two direct down-right lines are joyned together at the four corners, it is called Quadrangle with even sides or corners, but when the four lines are all of unlike and contrary length, then it is a Quadrangle of uneven sides, as the Figure sheweth.

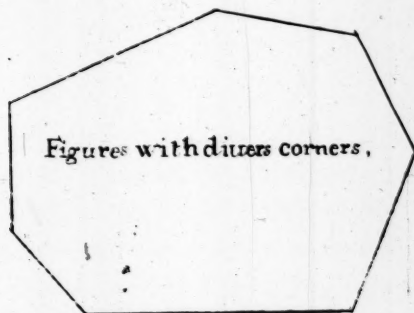
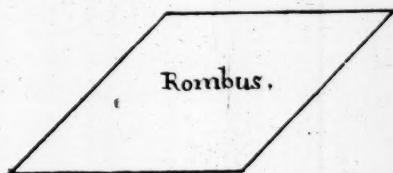
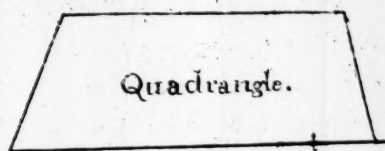
**Y**ou must note, that although all four corner'd Figures may be called Quadrangles, nevertheless, for that the direct four corner'd Figures are called *Quadrates*, for difference from them, I will name all Figures which are like unto a Table (that is, longer then broad) Quadrangles.

**W**hen four even long streight lines are joyned together at the corners, they are called *Quadrates*; which are four corner'd: when you make the two corners thereof sharp; and the other two corners somewhat blunter, then it is called a *Rhombus*.

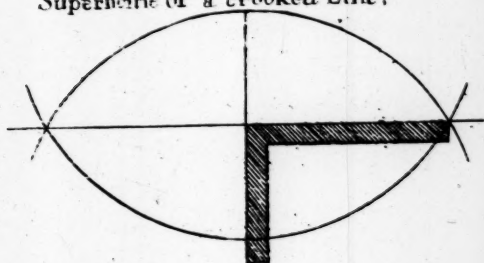
**A**lthough you may turn and make all the Figures aforesaid right four square: yet the Workman may find other Figures with divers corners, the which (as I will hereafter shew) he may make four square.

when





Superficies of a crooked Line.



## Of Geometrical practice.

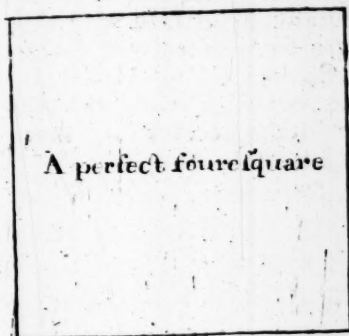
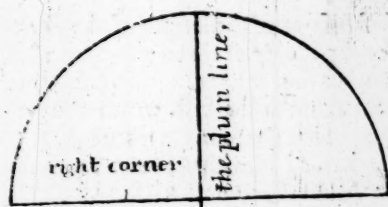
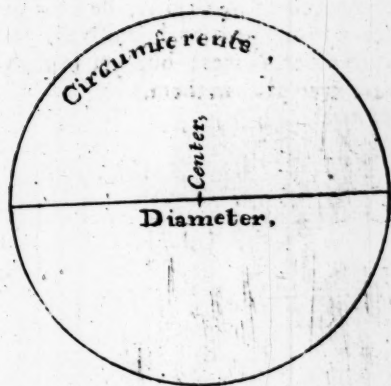
WHen a man with his compass draweth a bowe, and after that he draweth another bow right against it, that is called a *Superficies* of crooked lines, with two like corners: and then draweth a streight line from the one corner to the other: and from one point or center where the Compass stood to the other, another streight line; thereby you shall find the right four parts thereof.

BUT if a man draw a whole right line with his Compass, that is called a full Circle or round *Superficies*, and the point in the middle is calld the Center, the utmost line is called Circumference: and if you draw a streight line through the Center, it is called a Diameter: because it divideth the Circle in two even parts.

WHen the half Circumference is cut through the Center of the Diameter, then it is called half a Circle: and if you make a streight line upright in the half Circle, then that line maketh two even quarters of a Circle, and divideth the Diameter also into two half Diameters.

WHen a man draweth four even long lines, and joyneth them together, they make a perfect corner d *Quadrans*: then if you draw a streight line from the one corner to the other, it is called *Diagonus*: because it divideth the four corners into two even parts.

Now

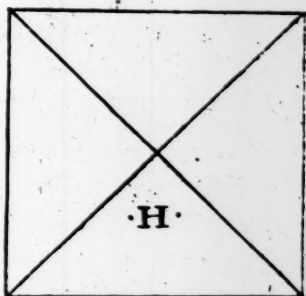
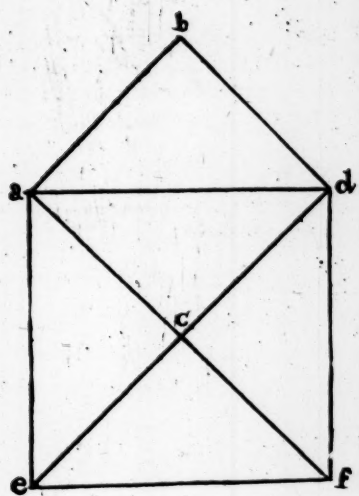


### *Of Geometrical practice.*

**N**OW when a Workman hath seen a forme of some of the most necessary *Superficies*, he must proceed further, and learn to augment or diminish the same, and to turn them into other formes: but yet in such sort, that they may have even parts in them.

**A**ND first, if out of the length of the Diagonus aforesaid, by the adding of three other even long lines, he maketh another four square: that four square shall be once as great again as the first. which is to be understood in this sort: That the four square of A. B. C. D. by the Diagonus is divided into two Triangles, and the greater four square A. D. F. E. containeth four such Triangles: but for that the two first four squares hang one within the other, therefore for the better shewing thereof, they are here once again set down severally: whereby you may see that the *Quadrate G.* (as I said before) containeth two Triangles, and the *Quadrate H.* containeth four such Triangles, so that the proof thereof is clearly to be seen.

H

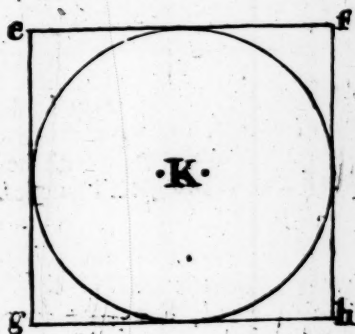
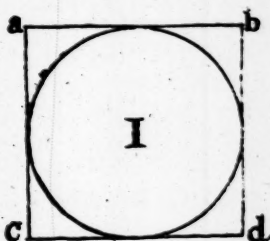
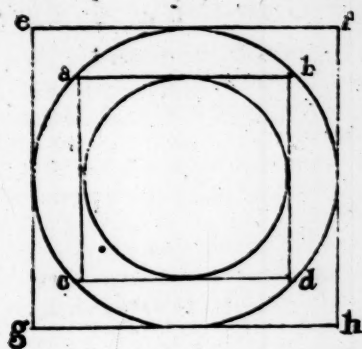


### *Of Geometrical practice.*

**I**F within a four square you make a Circle which toucheth the four sides of the said four square, and without the said four square another Circle which toucheth the corners marked A.B.C.D. Then the outmost Circle must be once as great again as the innermost : and then if about the greatest Circle you make another four square as C.D E.F. then the two four squares must in like sort be once as great again as the other. The proof whereof standeth hereby marked with the Letters K.L. for clearer understanding of the same.

**B**Y this also the projecture or the foot of the Bases of the Tuscan Columns or Pillars, and also the breadth of the foundation of them underneath by *Vitruvius* declared, is set forth.

The



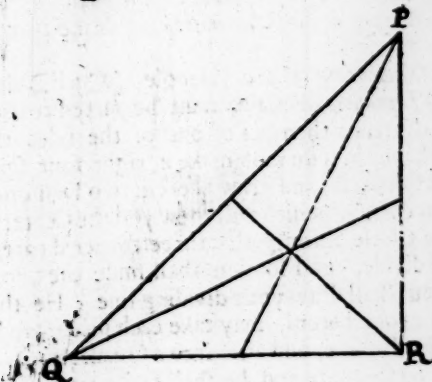
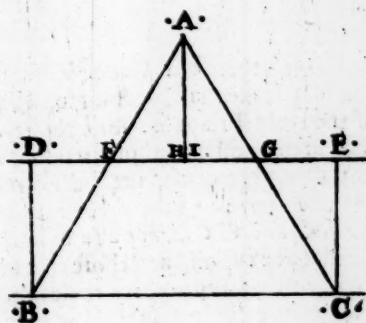
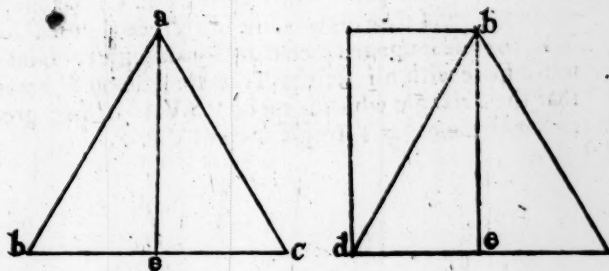
## *Of Geometrical Practise.*

**T**He Workman must yet proceed further, and learn to know how to change a Triangle into a Quadrangle, and also at last bring it to a right Quadrate, to the which I will set down divers formes. First, take a Triangle with even corners, as A.B.C. and divide the Base, (which is the name of all lower lines) B.C. in two even parts, and there place the Letter E. Then from the point E. to A. draw a line, which will divide the Triangle into two even parts. Then if you take that part which is marked A.E.C. and joyn it to the other part, marked A.E.B. it will make a Quadrangle, as A.D.B.E. made of a Triangle.

**Y**ou may also change this Triangle in other manner, dividing the lines A.B. and A.C. each in two like parts as F. and G. Then draw a line through D. E. as long as the Base B.C. Then shut up the two Equidistances, corner wise: and then the Quadrangle B.C.D.E. containeth so much in it as the Triangle A.B.C. and the proof thereof is, that the two Triangles B.C.F. and G.E.C. contain so much in them, as the two other Triangles A.F.H. and A.I.G.

**A** Triangle with even points, may be divided thrice into two equal parts, dividing each side in two parts, as in the Figure P. Q.R. it is seen through the three lines, which on either side make two great Triangles.



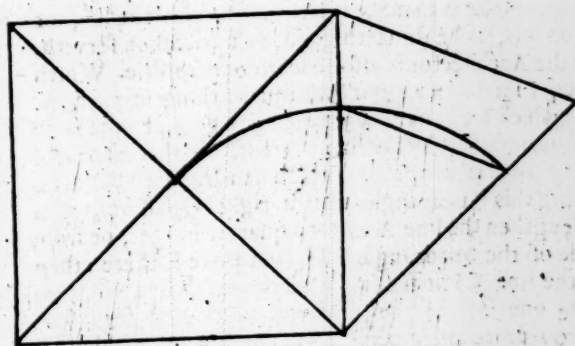
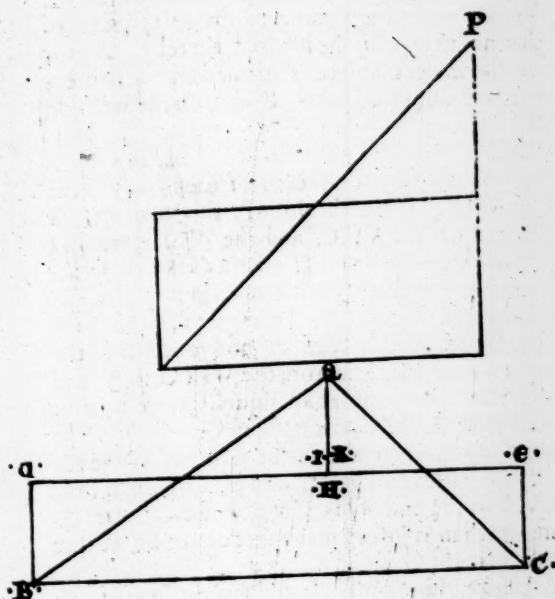


## Of Geometrical practice.

**T**He same Triangle P. Q. R. may thus be changed into a Quadrangle: divide the side P. Q. and the side P. R. each in two equal parts, then draw a line S. T. as long as Q. and R. and then draw a line direct downward from T. R. to close it up: and then that Quadrangle contains as much space within it as the Triangle aforesaid, because that the Triangle which is cut off P. S. V. is of like greatness with the other Triangle marked V. R. T.

**A**Nd although there is a Triangle of unequal sides, yet a man may make it a Quadrangle, in such sort as I said before of the right Triangle: for although the two Triangles that are cut off, and those two that are added unto it, are not of one greatness, yet the Triangles A. F. L. and B. D. F. are one as great as the other: and again, the Triangles A. G. K. and G. C. E. are also of one greatness: so that those that are cut off, and those that are added thereunto, are of one quantity. By these alterations aforesaid, a man may easily measure how many feet, ells or roods four-square, are contained in a three-corner'd *Superficie*.

**B**UT it falleth out, that a Triangle, (which is three corner'd) *superficie* or plain, must be parted cross-wise in two equal parts: then out of one of the sides that you will cut through, you must make a right four square, as from the side A. B. and draw therein two Diagonus from corner to corner, which will shew you the Center C. and draw one Circle through that three-corner'd part, which you will divide, and so you shall finde the two points, where you shall draw your dividing line. He that desireth any proof hereof, may take each piece, and alter it into a Quadrangle, and after into a Quadrate, as hereafter shall be shewed, and he shall find it true,

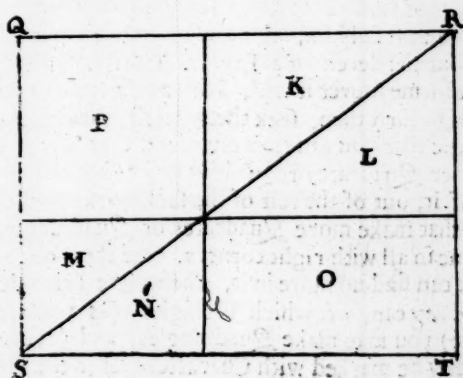
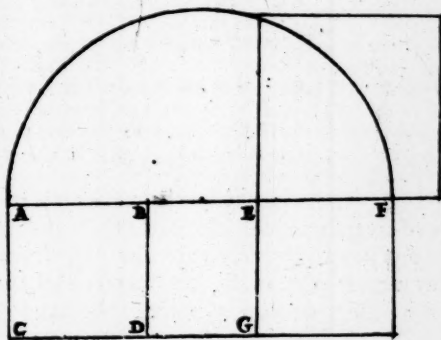
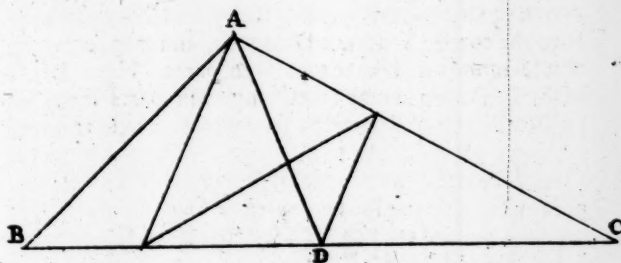


### *Of Geometrical practice.*

**A**N Architector must also undergo other Burthens, for that he must know how to divide a piece of ground, that no man may be hindred thereby. As for Example, if there were a piece of ground that lay three-corner'd wise, with unequal parts, having on the one side thereof a Well, but not in the middle: and this ground, or three-corner'd piece of Land is to be divided into two equal parts, in such sort, that each of them may have the use of the Well: it must be done in this manner. I make a Triangle marked A B.C. and the Well is marked with G. Now divide the line B.C. with a dark line in the two equal parts as the Letter D. sheweth, and then drawing a line from D. to A. then the Triangle is divided into two equal parts: but both of them cannot yet come to the Well: then draw another line from the Well G. to A. and from the point D. you must set an Equidistance against G.A. marked with E. and drawing from G. which is the Well: the black line to the letter E it will divide the ground in two even several parts, and each of them shall have the Well at the end of his Ground, for that part A. B.G.E. containeth in it just as many feet or roods, as that part which is marked G.E.C.

**I** Shewed before, how a man should make a four square Superficies once as great again as it is, but it may fall out, that a man is to make it but half as great again, or more or less, as he thinketh good, or as occasion serveth, which the Architector is also to learn of necessity. Which to shew, I set down a right four square thing marked A. B C,D, which I will have three quarters greater: the same three quarters I set by the side thereof, so that the same with the Quadrate together make a Quadrangle A.E. C.G. To bring this Quadrangle into a right Quadrate, you must lengthen the line A.E. yet a quarter longer, or from the side of the Quadrangle E.G. and place F. there: then upon the line A.F. make half a Circle: which line will shew you the one side of the Quadrate which you seek for: which quadrate being made, will contain as much in it as the Quadrangle already made. And in this manner you may change all Quadrangles which are long four corner'd pieces of work, into a just and true Quadrate.

Now

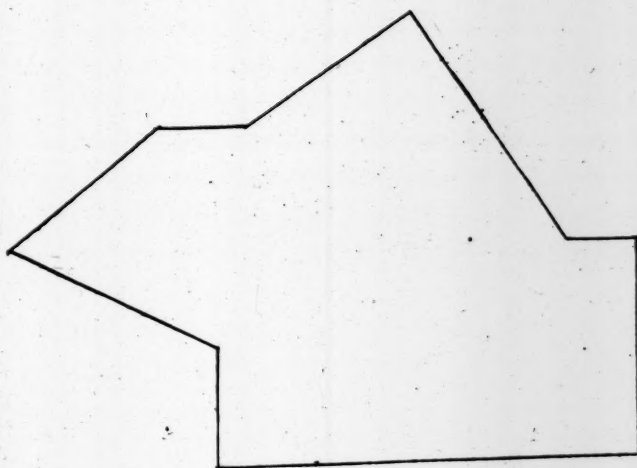
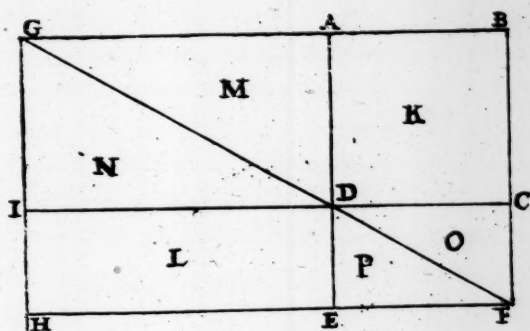


## Of Geometrical Practise.

**N**OW to prove that which I said before, you must join the *Quadrangle* with the *Quadrate* together, in one square *Superficie*, as Q.R.S.T. and from the corner R. to the corner S. draw a *Diagonus*, and it is certain that that *Diagonus* will make two even parts. Now *Eucl des* saith, that when a man taketh any even parts from even parts, the rest of the parts also remain alike: then take the Triangle K.L., and the Triangle M.N. which are both alike: the right four corner'd *superficie* P. is of the same greatness, that the longer *superficie* O is.

**A** Gain, you may easily change a *Quadrate* into a *Quadrangle*, as long or as narrow as you desire to have it, doing thus; Make your *Quadrate* A.B.C.D. and lengthen your Line A.B. and the Line B.C. When done, then set the length of the *Quadrangle*, which you desire to have upon the line A.G. Then from the point G. draw a line along by the corner of the *Quadrate* D. to the line C.F. and there you find the shortest line of the *Quadrangle*; and so to the contrary you shall by the least side of the *Quadrangle* finde the longest also, as you may also prove by the aforesaid Figure: for when you take away the Triangles M.N. and O.P. which are both alike: then the two parts which are K.L. are also alike.

**A**N Architector may by chance have a piece of work of divers unequal sides come to his hands, which he is to put into a *Quadrangular* or *Quadrate* forme, co know what it containeth, and specially when it belongeth to more then one man, whether it be Land or any other thing. For although the Architector or Surveyor of Land could not skill of Arithmetick or Ciphering: yet this rule cannot fail him, nor any other man that desireth to find out the deceit of a Taylor. Thus, I say then, let it be what forme soever it will, I set down this hereafter following. First then, seek the greatest *Quadrate* or *Quadrangle* that you can take out of it: that done, seek yet another *Quadrate* or *Quadrangle*, as big as you can take out of it, out of the rest of the said work: and if you can after that make more *Quadrates* or *Quadrangles* out of it, I mean all with right corners, take them out also: but if you can find no more in it, then make Triangles also as big as you can, of which Triangles (as you are taught before) you may make *Quadrangles*, and let every piece severally be marked with Characters, as in the Figure following may be seen.



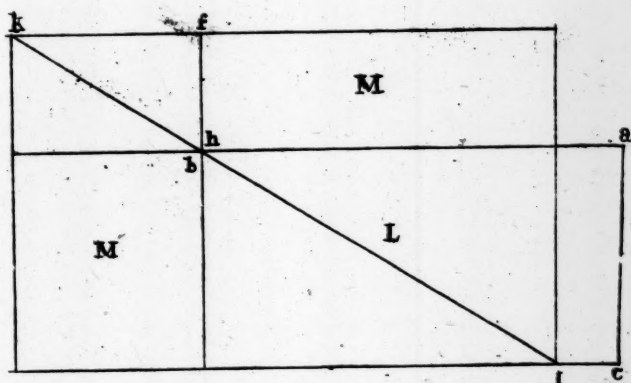
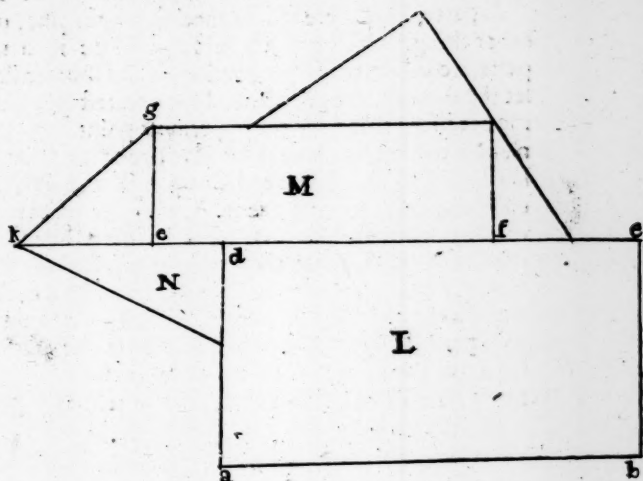


## Of Geometrical practice.

**L**et by Example your many corner'd Figures first be marked with the great Quadrangle with these Letters A.B.C.D. and then with a less Quadrangle, as E.F.G.H. the rest are all Triangles. Now set the greatest Quadrangle L. in a place by it self, and then the other marked with M. which set upon it, that the two corners or sides may be alike : which done, lengthen the line E.F. and the line E.G. and where they stay or touch under the great Quadrangle L. there set an I, from this I. a Diagonal line, being drawn through the corners B.H. the same line shall be drawn to the point : that, by the shutting of the Characters B.M.L.D. will shew you another Quadrangle, of the like quantity that the Quadrangle M. is : so that the whole Quadrangle D.C.L.M. containeth the two aforesaid Quadrangles. Touching the Triangles, when you have changed the same (according to your former instruction) into Quadrangles, as you may see by the Triangle N. so may you put that Quadrangle also in the greatest Quadrangles (for less trouble) The great Quadrangle A.L.M.C. is once again placed above with the small Quadrangle O.P.Q.R. set upon it, and the Diagonal line is placed behind the greater (which is L.M. T.S. both marked with N. so that the Quadrangle A.C.S.T. containeth three Quadrangles L.M.N. and as many more as there are: you may in this sort bring them all in one Quadrangle : if there falleth out any crooked lines, the skillful Architect or Workman may almost bring them into a square, and those Quadrangles, if need be, may also be reduced into perfect four squares, as aforesaid.

When

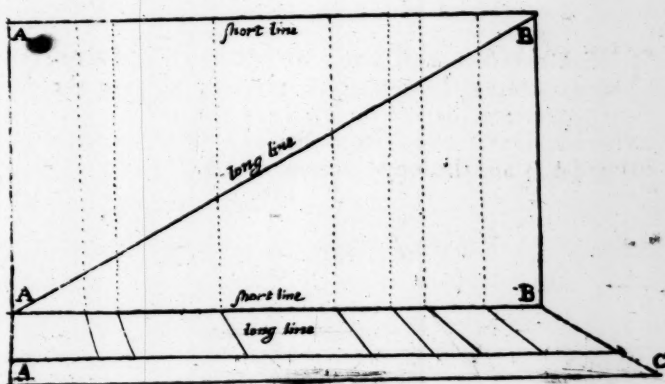
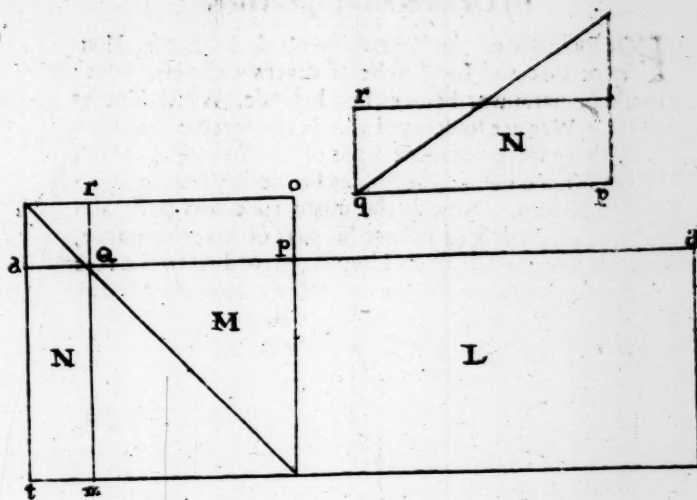




### *Of Geomtrical practice.*

**W**Hen a man hath a line or other things of unequal parts, and there is also another longer line, or some other thing, which a man would also divide into unequal parts, according to the proportion of the shorter line, then let the shortest line be A.B. and the greatest line A.C. now it is necessary that from the uppermost point A. you should make a corner, as A B. and A.A. Then take your longer line, and set it with the end C. upon B. and let the other end rest at the hanging line A. A. then from every point of the uppermost line A.B. let a hanging line fall upon the line A. C. so that they may be equidistant with the line A.A. and where the said lines cut through each other, there is the right division proportioned according to the smaller. This rule shall not only serve the Architector for many things, as I will partly shew: but will also serve many Artificers to reduce their small works into greater.

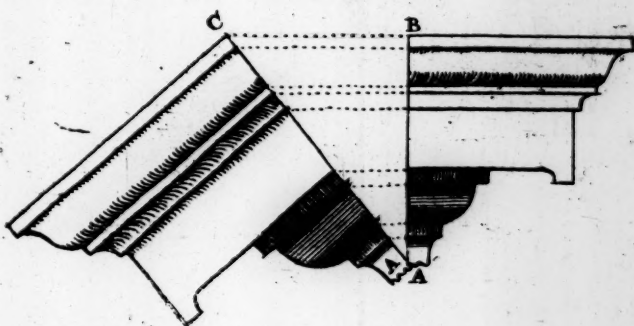
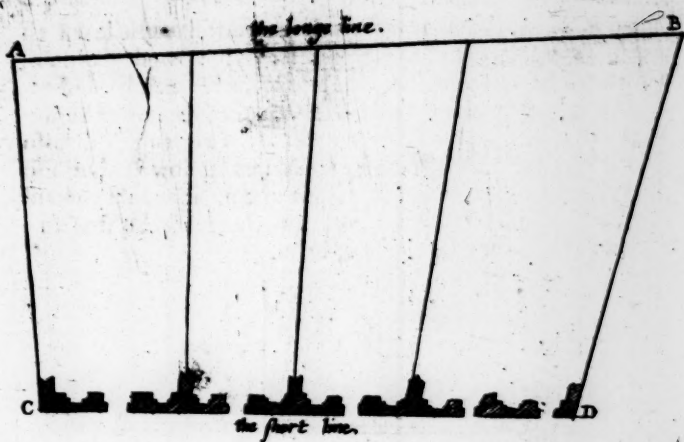
Let



### *Of Geometrical practice.*

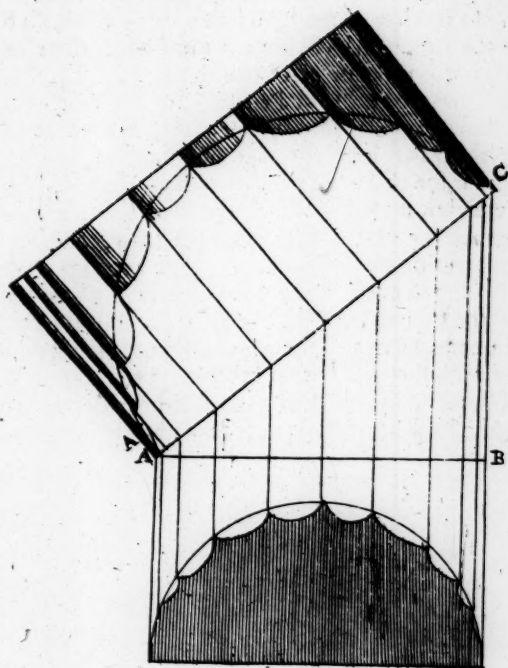
**F**OR Example of the Figure aforesaid, I suppose, Houses or Pieces of Land to be of divers wideness, which should be narrower before then behinde. Which Houses by Fire or War are so decayed, that in the forefront between C. D. there were but some signs of division to be seen of the houses, and behind the houses between A and B. no sign at all to be seen. Now as the misfortune was past, and that every man desired to have his part of his inheritance; then the Architector, as an Umpire, according to the rule aforesaid, should divide the longest line according to the proportion of the shortest, to give every man his own: as you may see by this Figure following.

**T**HE Architector must have a well-proportioned Cornice, which if he would make greater, keeping the same proportion, he may do it as he is formerly taught, as in this Figure following is shewed by the short line marked A.B. and the longest line marked A.C.



## Of Geometrical practice.

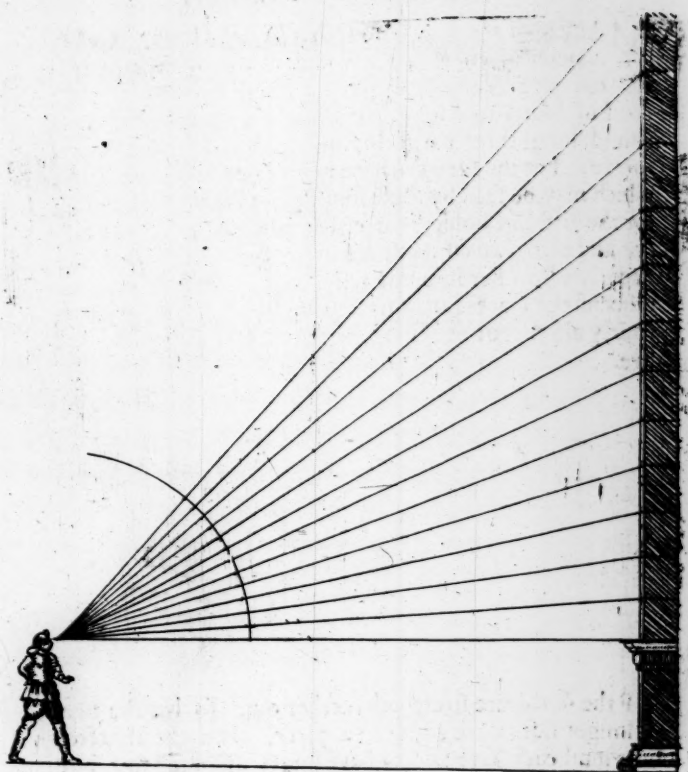
**A**N Architect or Workman must likewise learn to augment and make greater a hollowed Column, which he may also do by the two lines aforesaid, and although the Column should be a *Dorica* (yet it is to be understood of all kinds of Columns. This rule will also serve (not only for the three Figures set down) but also for as many, as if I should shew them, it would contain a whole book of them alone, and therefore this shall suffice at this time for the Workman.



## *Of Geometrical practise.*

**T**He further that any material thing standeth from our sight, so much it seemeth to lessen, and diminish by means of the Air, which consumeth our sight: therefore when a man will make or place one thing above another, against any place or wall, and would have the same thing to shew above in the middle, and beneath, as great in one part as in the other, it is convenient for him to follow this rule, which is, for that our sight runneth in circumference: therefore a man must first chuse the place, from whence he will see the same: there placing a Center, and then draw a quarter of a Circle from your eye upwards, Which dividing in even parts, you shall, by the lines that go out of the Center through the Circle against the wall, finde the unequal parts: the which although upwards against the wall, they shall seem greater: yet in your sight they will shew all of one greatness. By this rule you may also measure heights, aiding your self with the numbers.

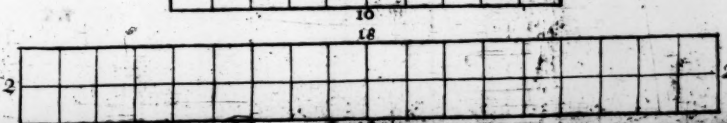
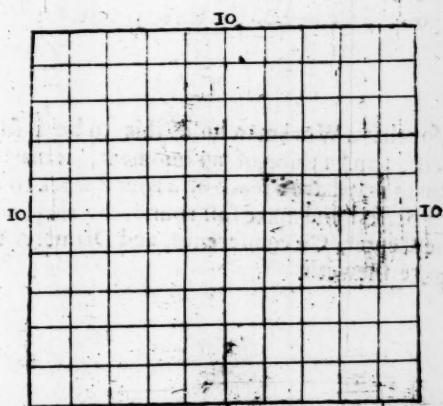
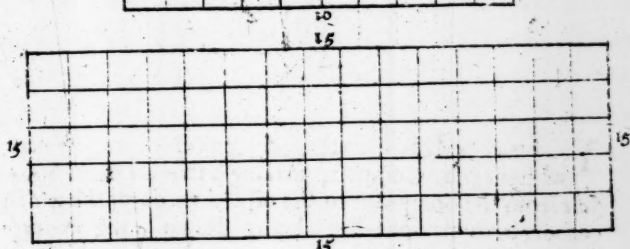
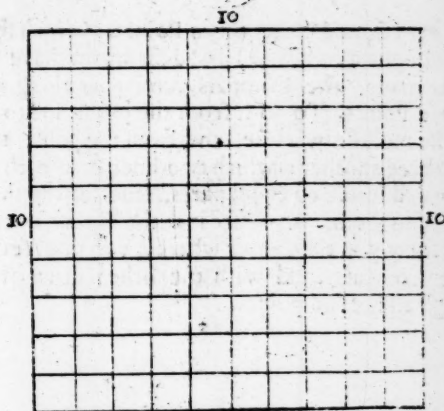




## Of Geometrical Practise.

**M**Any men are of opinion, that streight lines, in what manner soever they are closed, contain as many spaces one way as another, (that is to say) if a man had a cord of forty foot long, and should lay it diversly, in a round, long, three corner'd, four square, or five-corner'd forme: but the *superficies* are not of one self-same space, which may be seen by these four square Figures following; for the first line holdeth on either side ten, which is forty, and the space contains ten times ten, which is an hundred. The other line upon the two longest sides, contains fifteen spaces, and on the shortest sides five, making forty also: but five times fifteen make but seventy and five.

**I**F the Square stretcheth further out, so that the two longer sides were eighteen a piece, then the shortest sides must each have two to have forty upon the line, but the space should contain but six and thirty. And hereby you see what a perfect forme may do against an imperfect. And this rule the Workman shall use, that he may not be deceived, when he will change one forme into another.

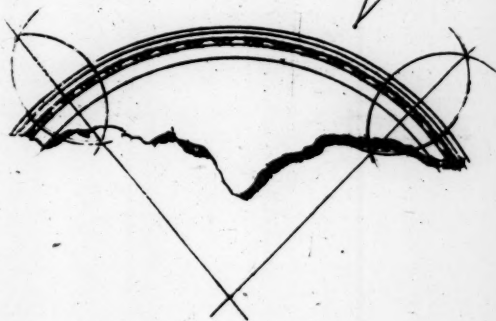
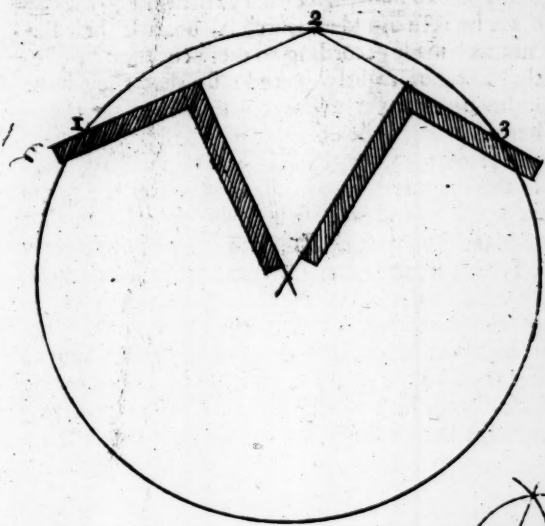


### *Of Geometrical practice.*

**I**F a man should make three Points, (which should not stand upon a right line) and desiring to have a circumference made, the Compass must pass along upon each of these Points. To do it from the point one to the point two, he must draw a line, and from the point two to the point three another: which two lines shall each of them be divided into two equal parts, and setting the Squires half way in them, as you see it in the Figure, by that Cross it will shew you the Center, wherein you must set one foot of the Compass, and with the other draw the Circle through all the said points.

**Y**OU may find the Center of three points another way, without your Compass, making a two-corner'd *superficie* from the one point to the other, through the which corners two straight lines being drawn long enough downwards where they cross one over the other, they will shew you the Center of the three points.

**B**UT for that a Workman holds this to be a superfluous speech, and a thing of no moment, it may be that a Workman may have a piece of a round work to do, which he is to perfect and make full round, by this rule he may find the Center, Circumference, and Diameter thereof, as the Figure sheweth.



## *Of Geometrical practice.*

WE finde in Antiquities, and also in modern works, many Pillars or Columns, which beneath in the joynts at the Bases are broken asunder, which is, because their Bases were not well made according to their corners: or else, because they are not rightly placed: so that they have more weights upon them on the one side then on the other, whereby the Cantons break, which the Workman, by knowledge of the lines, and help of Geometry, may prevent in this manner: that is, he must make the pillar round underneath, and his Base hollow inward: so that when you place the Pillar by the lead, it may presently settle it self without any hurt. To finde this roundness, you must set the one point of the Compass upon the highest part of the pillar that is under the A. and the other point thereof upon B. and then draw or winde it about to C. and that shall be the roundness, making the hollowing of the Base, according to the same measure: you may do the like with the Capital, as you may see in the Pillar by it.

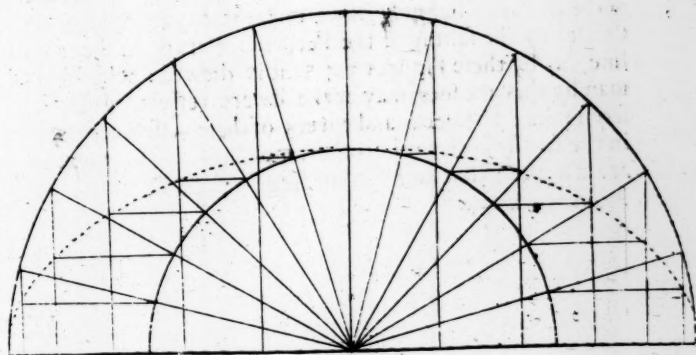
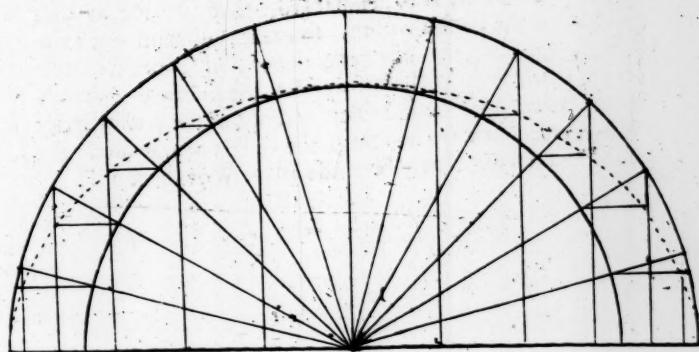


## *Of Geometrical practice.*

**I**F a Workman will make a Bridge, Bowe, or any other round Arched piece of work, which is wider then a half Circle, although Masons practise this with their lines, whereby they make such kinde of works, which shew well to mens sight, yet if the Workman will follow the right Theorick and reason thereof, he must observe the order heretofore shewed. When he hath the wideness of the height, then he must make half a Circle out of the middle : after that, upon the same Center, he must make another lesser Circle, which must be no greater then he will make the height of the Bowe, or Arch : then he must divide the greatest Circle in equal parts, which must all be drawn with lines to the Center : then you must hang out other Perpendiculars upon your Lead : and where the lines that go to the Center cut through the lesse Circle, from thence you must draw the cross lines toward the Perpendicular, and where they close together there the Bowe or Arch which is made, shall be closed : as by the points or pricks hereunder is shewed.

**B**Ut if you desire to make the Bowe or Arch lower, then you must follow the rule aforesaid, and make the innermost Circle so much less, which is to be understood, that the more parts that you make of the greater Circle, so much the easier you shall draw the crooked lines which you would have : from this rule there are many others observed, as hereafter you shall see.





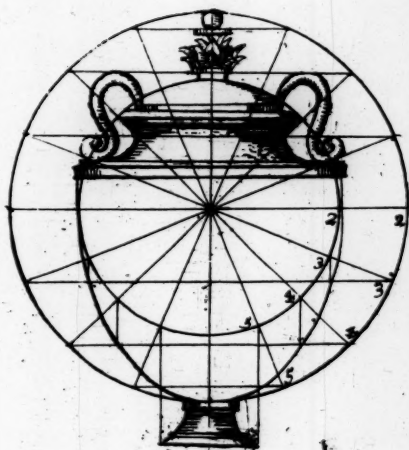
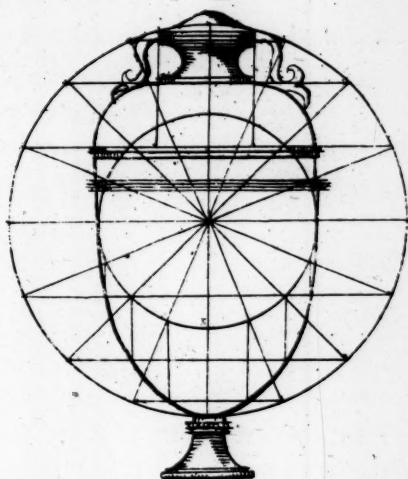
## Of Geometrical Practice.

**C**alling the former rule to minde, I devised the manner how to forme and fashion divers kinds of vessels by the same, and I think it not amiss to set down some of them: This only is to be marked, that as wide as you will make the vessels within, so great you must make the innermost Circle. The rest, the skilful Workman may mark by the Figures, that is, how the lines are drawn to the Center, and the Paraboles, and out of the small Circle. The Perpendiculars hanging, the vessels are formed: the foot and the neck may be made as the Workman will.

**B**ut if you will make the body of the vessel thicker, then you must make the half Circle so much the greater, and make the belly hanging down under it, to touch the great Circle, by the falling of the Perpendiculars upon the cross line, as by these Figures 3.4.5. it is shewed: whereby a man by this means may make divers vessels, differing from mine. The necks and covers of these vessels are within the small Circles: the other members and Ornaments are alwayes to bee made, according to the will of the ingenious workman.

f

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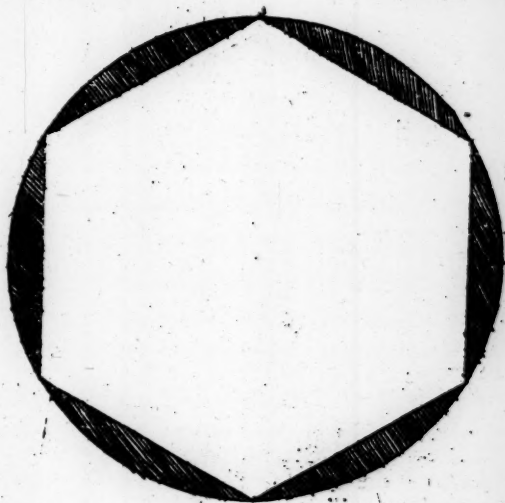
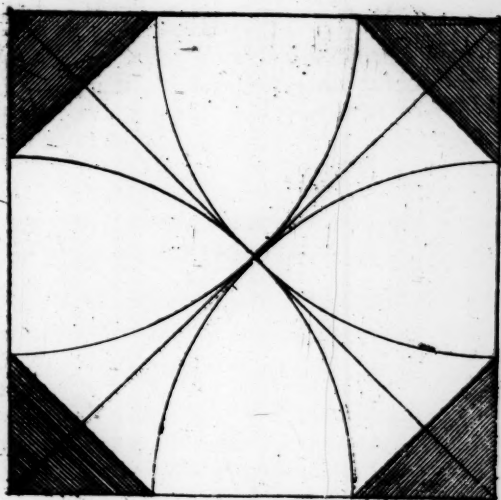
## Of Geometrical practice.

**T**ouching the Circles there are many Figures which are round, and yet some have 5. 6. 7. 8. 9. and 10. corners, &c. But at this time, I will speak only of these three principally : because they are most common.

**T**his *Octogonus* or eight points is drawn out of a right four corner'd square, drawing the *Diagonus* which will shew you the Center : then set one foot of your Compass upon the corners of the *Quadrate*, and leading the other foot through the Center, directing your Circle toward the side of the *Quadrate*, there your eight points shall stand to make it eight corner'd, and although a man might only do it by the Circle, making a cross therein, and dividing each quarter in two, yet it will not be so well, and therefore this is a surer and more perfect way.

**T**he *Hexagonus*, that is, the sixt-corner'd Circle, is easiest made in a Circle : for when the Circle is made, you may divide the Circumference in six parts equally, without stirring the Compass, and drawing the line from one point to another, the six corners are made,

But

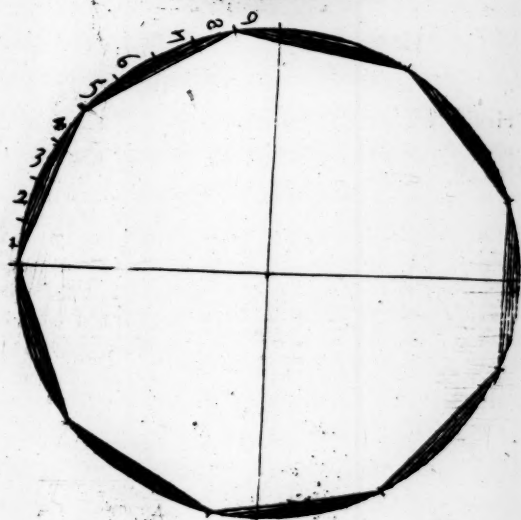
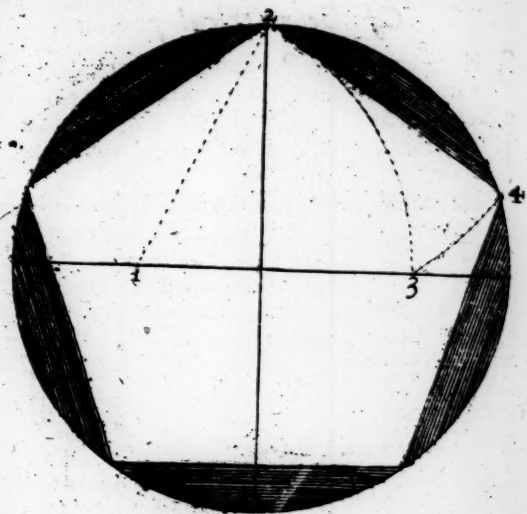


## Of Geometrical practice.

**B**Ut the *Pentagonus* that is five-corner'd, is not so easily to be made as the others are, because it is of an uneven number of corners, notwithstanding you may make it in this manner : when the Circle is made, then make a streight crosse therein : then divide the one half of the crosse line in two parts, as it is marked with the Figure 1. then place one foot of the Compasses at the Figure 1. and the other foot under the Figure 2. draw downward to the Figure 3. resting that foot, and reaching the other to the afore-said place under 2. and you will have the length of every side of the *Pentagonus*. In this Figure also you shall find the *Diagonus*, that is, ten corners : for, from the Center to the Figure 3. that shall be one side thereof, you may also make a sixteen-corner'd Figure out of this wideness 3. 4 and place a particular line upon the point 1. And *Albertus Durens* saith, that the same also will serve to make a seven-corner'd Figure.

**T**His figure will serve such men as are to part a Circumference into unequal parts, how many soever they be: but not to bring the Reader into confuseness, with making of many formes, I will only set down this divided into nine corners, which shall serve for an example of all the rest, which is thus : Take the quarter of the Circle, and divide it into nine parts, and four of these parts will be the ninth part of the whole Circumference : you must also understand the same so, if you divide a Quadrant into eleven, twelve, or thirteen parts, &c. for that always four of these parts be the just wideness of your parts required.

There



## Of Geometrical practice.

**T**Here are many *Quadrangle* Proportions, but I will here set down but seven of the principallest of them which shall best serve for the use of the Workman.

**F**irst, this forme is call'd a right four-corner'd *Quadrante*.

**T**He second forme or figure in Latin, is called *Sexquiquarta*, that is, which is made of a four-corner'd *Quadrante*, and an eighth part thereof joyned unto it.

**T**He third Figure in Latin is called a *Sxquitercia*, that is, made of a four-squar'd *Quadrante*, and a third part thereof joyned unto it.

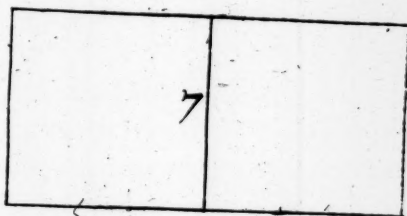
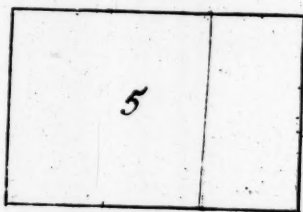
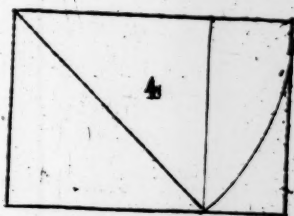
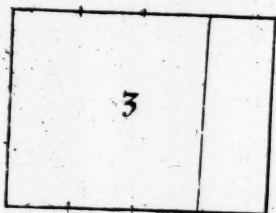
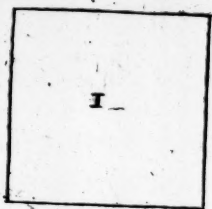
**T**He fourth is called *Dia onea* of the line *Diagonus*: which line divideth the four-squar'd *Quadrante* cross through the middle, which Diagonal line being toucht from under to the end thereof upwards with the Compass, and so drawn, will shew you the length of the Diagonal *Quadrangle*: but from this proportion there can be no rule in number well set down.

**T**HE fifth Figure is called a *Sexquialtera*, that is, a four square, and half of one of the four squares added unto it.

**T**He sixth is called *Superbitionsternias*, that is, a four square, and two third parts of one of the four squares added thereunto.

**T**HE seventh and last Figure is called *Dupla*, that is, double: for it is made of two four square formes joyned together: and we finde not in any Antiquities, any forme that passeth the two four squares, unless it be in Galleries, Entries and other to walk in: and some Gates, Doors and Windows have stood in their heights: but such as are wise will not pass such lengths in Chambers or Halls.



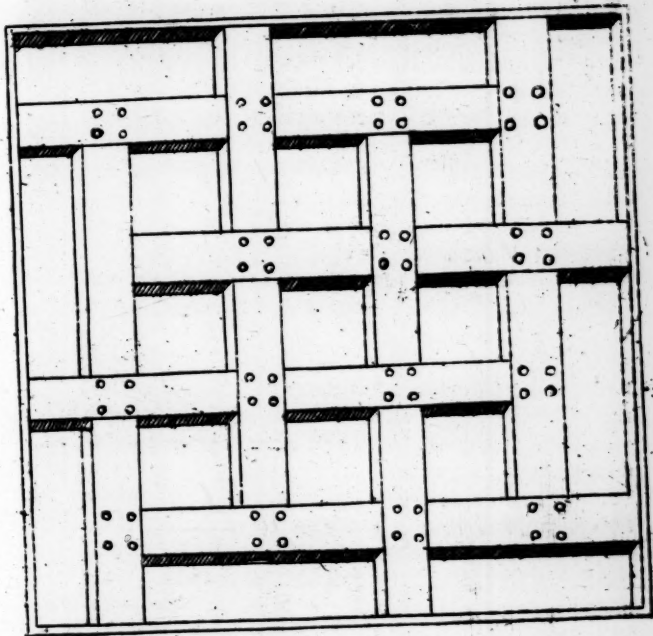


### *Cf Geometrical Pract. ce.*

**M**Any Accidents like unto this, may fall into the Workmans hand, which is, that a man should lay a sieling of a house in a place which is fifteen foot long, and as many foot broad, and the rafters should be but fourteen foot long, and no more wood to be had : then in such case, the binding thereof must be made in such sort as you see it here set down, that the rafters may serve, and this will also be strong enough.

**I**T may also fall out, that a man should finde a Table of ten foot long, and three foot broad : with this Table a man would make a door of seven foot high, and four foot wide. Now to do it, a man would sawe the Table long-wise in two parts, and setting them one under another, and so they would be but six foot high, and it should be seven : and again, if they would cut it three foot shorter, and so make it four foot broad, then the one side shall be too much pieced. Therefore he must do it in this sort : Take the Table of ten foot long and three foot broad, and mark it with A. B. C. D. then sawe it Diagonal-wise, that is, from the corner C. to B. with two equal parts, then draw the one piece thereof three foot backwards towards the corner B. then the line A. F. shall be four foot broad, and so shall the line E. D. also hold four foot broad : by this means you shall have your door A. E. F. D. seven foot long, and four foot broad, and you shall yet have the three-corner'd pieces marked E. B. G. and C. F. and C. left for some other use.

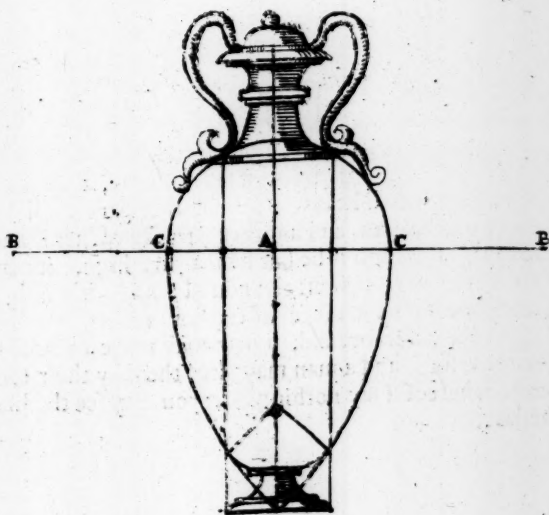
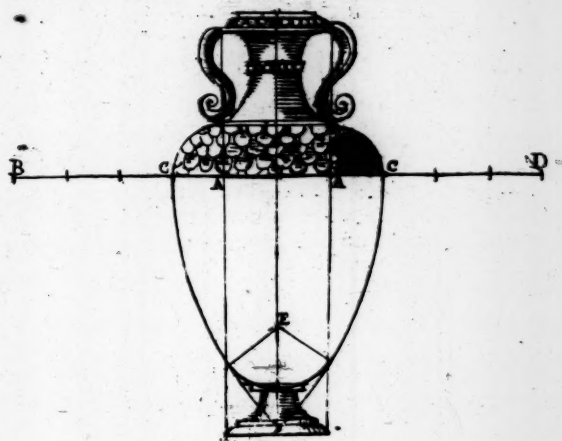
IT



## Of Geometrical practice.

**I**T is an excellent thing for a man to study or practise to do any thing with the Compasse, whereby in time men may find out that which they never imagined: as this night it happened unto me, for that seeking to find a neerer rule, to make the forme of an Egge, then *Albertus Durer* hath set downe, I found this way to make an Antick vessell, placing the foot beneath at the foot of an Egge, and the necke with the handles above upon the thickest part of the Egge. But first you must frame the Egge in this manner: Make a streight cross of two lines, and divide your cross line in ten equal parts: that is; on each side five. Then, set the Compass upon the Center A, and with the other foot thereof, draw in two parts, that is, to C. making half a Circle upwards. That done, set one foot of the Compass upon the point marked B. and with the other draw in the uttermost point C. drawing a piece of a Circle downwards toward the Perpendicular, and doing the like on the other side, you must make a point below. Then take the half of the half Circle above that two parts, and place it at the undermost point of the Perpendicular upwards above O, where the Center to close the Egge, shall stand: the rest under shall be for the foot: the neck, without doubt, may be made two parts high, and the rest according to the Workmans pleasure, or according to the Figure here set down.

**Y**OU may also make another forme of a Cup or vessel, after the rule aforesaid. But from the point A. (which doth shew the bredth of the foot, and the wideneis of the mouth) you must make your Circle upwards from C. unto the two Perpendiculars, where the body shall be closed up. The neck standing above it shall be two parts high: but the rest of the Workmanship shall be made according to the will and device of the Workman.

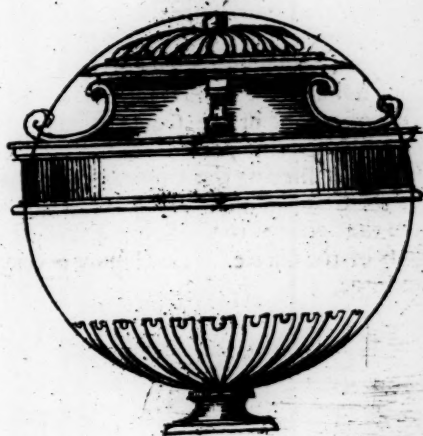
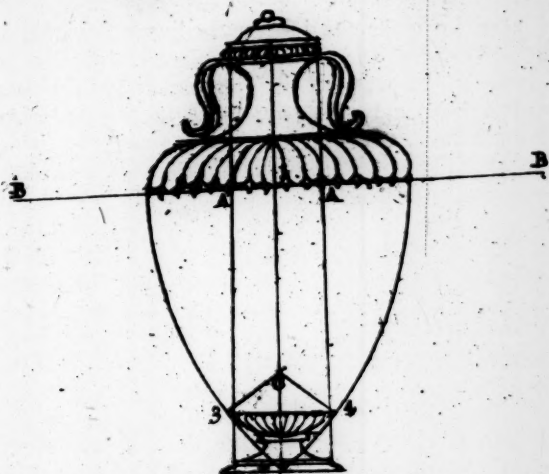


## *Of Geometrical practice.*

**B**Y this means you may make other different ands of Cups or vessels: but these that follow, you must make in this sort: you must divide your cross line in twelve parts through the point A. making two Perpendiculars to shew the foot and the neck: then setting one foot of the Compass upon B. and the other foot upon 1. drawing a piece of a Circle downwards towards the Perpendicular: and the like being done on the other side to the Figure of 2. then place your Compass upon the point C. and touching the sides 3 and 4. then the bottom of the vessel will be closed up: then place the Compass upon the point between 1. and A. and it will be the roundness of the vessel above: the other four parts serve for the neck of the vessel, with the rest of the work.

**A** Man may make a vessel only by a Circular forme, making therein a circular cross, and dividing every line into six parts: the half-circle shall be the belly of the vessel, and a sixth part upward for a Freese, that there may be more place to beautifie it: another part shall be the height of the neck, and another part the corner: and for the foot, although it be but half a part high, it may well go a sixth part without the round: and although I have set down but six manner of cups or vessels, yet according to the rule aforesaid, a man may make an infinite number of vessels, and a man may alter them by their Ornaments, whereof I say nothing that you may see the line the better.

A Man

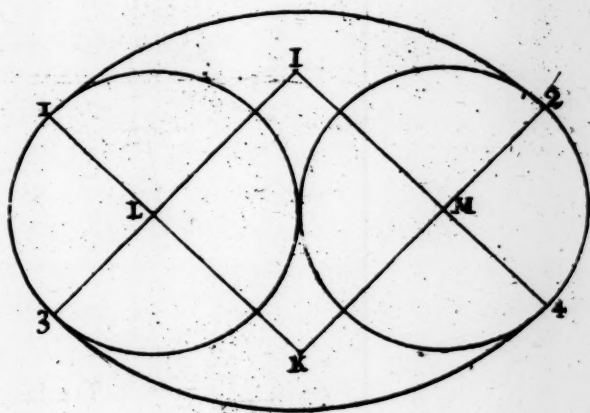
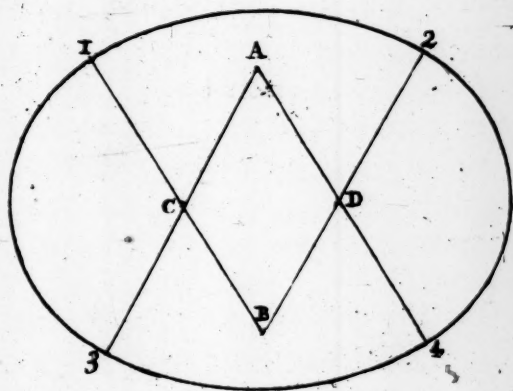


## *Of Geometrical practice.*

**A** Man may make Oval formes in divers fashions, but I will only set down four. To make this first Figure, you must set two perfect Triangles one above the other, like a Rombus, and at the joyning of them together, you must draw the lines through to 1. 2. 3. 4. and the corners A. B. C. D. shall be the four Centers, then set one foot of the Compass upon B. and the other upon I, and draw a line from thence to the Figure 2. After that, from the point A. and 3. to 4. you must also draw a line: which being done, set the one end of the Compass in the point C. and then draw a piece of a Circle from 1. to 3. and again, the Compass being in the Center D. draw a piece of a Circle from 2. to 4. and then the forme is made. You must also understand, that the nearer that the Figures come to their Centers, so much the longer they are: and to the contrary, the further that they are from their Centers, the rounder they are: yet they are no perfect Circles, because they have more then one Center.

**F**OR the making of the second Oval you must first make three Circles, as you see here drawing, where the four straight lines stand: the four Centers shall be I. K. L. M. Then placing one point of the Compass in K. you must draw a line with the other point from the Figure of 1. to 2. Again, without altering the Compass, you shall set the one foot of the Compass in I. and so draw a piece of a Circle from the figure 3. to the figure 4. and that maketh the Compass of the Circle. This Figure is very like the form of an Egge.





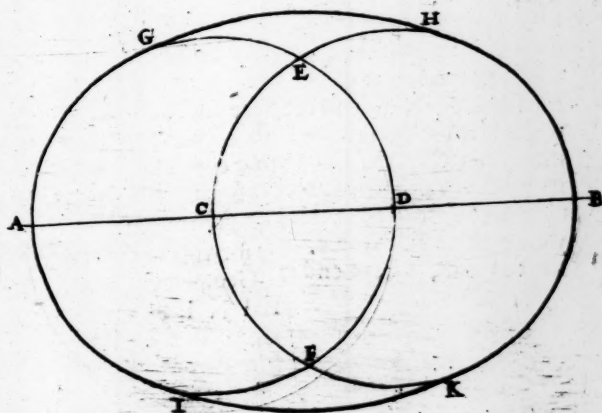
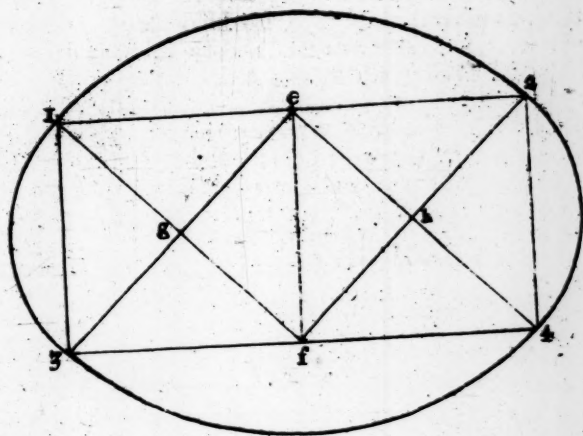
### *Of Geometrical Practi.ce.*

**T**HE third forme is made by two foure corner'd squares, drawing Diagonen lines in them, which shall shew the two Centers G. H. and the other two corners E. and F. Then draw a piece of a Circle from F. to the figure 1. and so to 2. Do the like from E. to 3. and 4. which done from the points G. and H. make the two sides from 1. to 3. and from 2. to 4. and so shut up the Ovale.

**I**F you will make this fourth Oval, draw a line at pleasure as A.B. then set one foot of the Compasses at C. and strike a Circle, then remove the Compasses, and set one foot at D and strike another Circle, then set one foot of the Compasses at E. and close up the line from G. to H. then set one foot at F, and close the line from I to K.

And although our Authour saith, there are four forms of Ovals; yet this last figure is of the same form as the first, only this is easier to make.

Touching



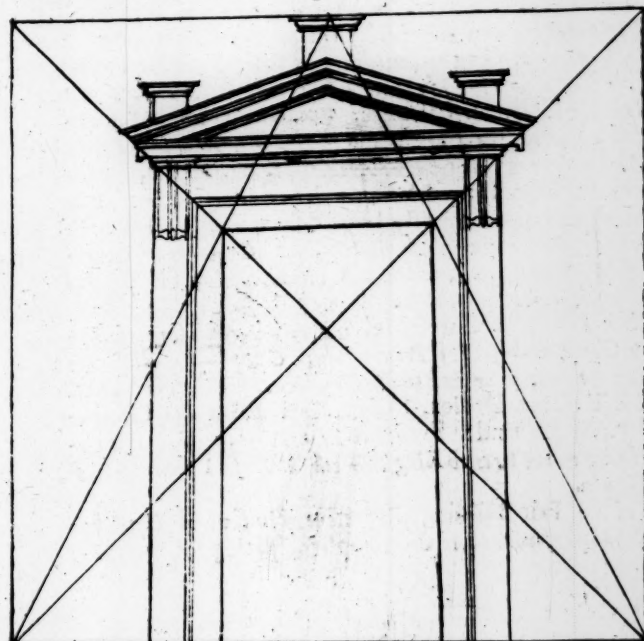
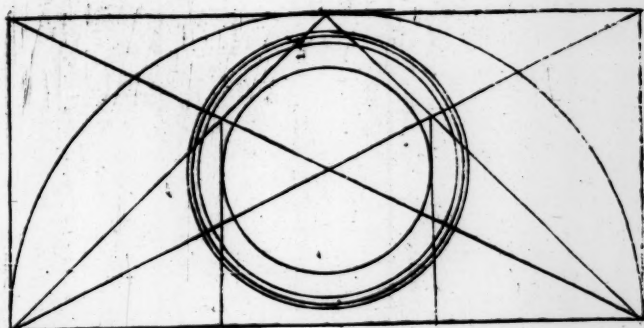
## *Of Geometrical practice.*

**I**T hapneth many times that a Workman hath an eye or round Window to make in a Church, as in ancient times they used to make them, and he doubted of the greatness thereof, which if he will make after the rules of Geometry, he must first measure the breadth of the place where he will set it, and therein he must make a half Circle: which half Circle being inclosed in a Quadrangle, then he shall finde the Center by two Diagonal lines: then he must draw two lines more, which shall reach from the two lowermost corners above the Center, and touch the just half of the Circle above: and where the said lines cut through the Diagonal lines, there you must make two Perpendicular lines, which Perpendicular lines shall shew the wideness of the desired window: the list about it may be made the sixth part of the Diameter, being round in breadth.

**I**F a Workman will make a gate or door in a Temple or a Church, which is to be proportioned according to the place, then he must take the wideness within the Church, or else the breadth of the wall without: if the Church be small, and have Pilasters or Pillars within it: then he may take the wideness between them, and set the same breadth in a four square, that is, as high as broad, in which four square the Diagonal lines, and the two other crosse cutting lines will not only shew you the wideness of the door, but also the places and points of the ornaments of the same door, as you see here in this Figure. And although it should fall out, that you have three doors to make in a Church, and to that end cut three holes, yet you may observe this proportion for the smallest of them. And although (gentle Reader) the crosse cutting thorow or dividing is innumerable, yet for this time, lest I should be too tedious to us, I here end my Geometry.

FINIS.





**A CATALOGUE** of some Books and Prints,  
as are Printed for Robert Prick, and are to be sold at  
his Shop in *White-cross-street*, and likewise at the Golden  
Lion at the Corner of *New-Cheapside* near *Bethlehem*.

*A New Treatise of Architecture, according to Vitruvius, Wherein is discoursed of the five Orders of Columns, viz. The Tuscan, Dorick, Ionick, Corinthian, and Composite. Divided into seven Chapters. Which declare their different Proportions, Measures and proper Names, according to the Practice of the ancient Architects, both Greeks and Romans; as also of their Parts general and particular, necessary in the building of Temples, Churches, Palaces, Castles, Fortresses, and all other Buildings with their Dependents: As Gates, Arches-Triumphant, Fountains, Sepulchres, Chimneys, Cross-bard Windows, Portals, Platforms, and other Ornaments: serving as well for the beautifying of Buildings in Cities, as for necessary Fortifications of them. Designed by Julian Mauclerc Lord of Lignerou Mauclerc, Broslandiere and Remanquis. Whereunto are added the several Measures and Proportions of the famous Architects, Schamozzi, Palladio and Vignola: with some rules of Perspective. The whole represented in fifty large Prints, enriched with the rarest Ornaments of Antiquity, and Capitals of extraordinary greatness, with their Architraves, Friezes and Cornishes proportionable.*

*A New Book of Architecture, wherein is represented forty Gates and Arches Triumphant, Composed of different Inventions, according to the Five Orders of Columns, viz. The Tuscan, Dorick, Ionick, Corinthian and Composite. By Alexander Francine Florentine, Engineer in Ordinary to the French King: With a Description of each Figure.*

*The Art of Fair Building: Represented in several Uprights of Houses, with their Ground-plots, fitting for persons of*



*Several*

*several Qualities. Wherein is divided each Room and Office according to their most convenient occasion, with their Heights, Depths, Lengths, and Breadths, according to Proportion. With Rules and Directions for the placing of Doors, Windows, Chimneys, Beds, Stairs, and other conveniencies: with their just measures for their best advantage, both of Commodiousness, Health, Strength and Ornament. Also a Description of the Names and Proportions of the Members belonging to the framing of the Timber-work, with Directions and Examples for the placing of them. By Pierre le Muet, Architect in Ordinary to the French King, and Surveyor of his Designs and Fortifications in the Province of Picardy.*

*A Book of Architecture, containing Cieling-pieces, Chimney-pieces, and several sorts useful for Carpenters, Joiners, Carvers, Painters, invented by J. Barber.*

**GETHINGS Redivivus:** *or the Pens Master-piece. Being the last Work of that Eminent and Accomplished Master in this Art. Containing Examples of all curious Hands written, and now in practice in England, and the Neighboring Nations: With necessary Rules and Directions towards the attaining of Fair Writing. Also Directions for making the best Pens, and several sorts of very good Ink, as black, red, green, yellow and purple; and how to write with Gold and Silver, and to polish it to make it glisten. Likewise how to Etch or Engrave a Coat of Arms, Figure or Pose, on Silver, Copper, Brass, Iron or hardened steel. With an Appendix, Shewing the exact manner of making all sorts of Bonds, Letters of Attorney, Releases. Scripturæ: Stories in large sheets, as Adam and Eve, Abraham offering up his son Isaac, Elisha fed by Ravens with the woman of Samaria, the Judgment of Solomon between the two Harlots, Susanna and the two Elders, Queen Esther, &c. and several others of the Old and New Testament.*